

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 27 OCT 2005

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| Applicant's or agent's file reference JTS/SD/P13730PC | | FOR FURTHER ACTION | | See Form PCT/PEA416 |
| International application No. PCT/GB2004/003140 | | International filing date (day/month/year) 19.07.2004 | Priority date (day/month/year) 18.07.2003 | |
| International Patent Classification (IPC) or national classification and IPC B01D53/32, A61L9/22, F24F3/16, H01T23/00, C01B13/11, H01T19/00 | | | | |
| Applicant HALLAM, David Richard | | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 4 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 18.05.2005 | | Date of completion of this report 26.10.2005 | | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | | Authorized Officer Eijkenboom, A Telephone No. +49 89 2399-8616 | | |



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/003140

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-30 as originally filed

Claims, Numbers

1-18 filed with telefax on 18.05.2005

Drawings, Sheets

1/2, 2/2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/003140

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | |
| | No: Claims | 1-14 |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 1-14 |
| Industrial applicability (IA) | Yes: Claims | 1-14 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Ad section V:

1. Claim 1 is directed to an apparatus, namely an air filtration cartridge, which, thus, is and can only be defined by apparatus features of the air filtration cartridge.

The essential apparatus features defining the air filtration cartridge (1) of claim 1 are:

- (a) a casing (2) having
- (b) an upstream stage (3) having chamber (4) with inlet (5) and outlet (6) and at least one low power coronal discharge ozone generator (10),
- (c) a downstream stage (8) coupled to outlet (6) and having a high airflow electrostatic filter (9).

The remaining wording of claim 1 is directed to the suitability of the air filtration cartridge or to the result to be achieved by the air filtration cartridge without, however, presenting or imposing additional apparatus features to the device of claim 1. In other words, any prior art device comprising the same apparatus features as the cartridge of claim 1 and suitable for the same purpose would prejudice the subject-matter of the claim.

2. In relation to the discussion of the prior art documents, reference is made to the passages cited in the International Search Report.
- 2.1 DE 298 08 126 U (D1) refers to a replaceable air purification cartridge (1) in a casing comprising an ozone generating ionisation chamber (5) with its outlet connected to an electrostatic filter (10). The activated carbon filter (13) for ozone emission reduction is an optional feature of the device since it forms part of dependent claims 4 and 5 of D1. Moreover, a person skilled in the art would not consider the activated carbon filter equivalent to an ozone decomposition catalyst.

As the device of D1 comprises all the essential features of the device of claim 1 and is suitable to keep the concentration of ozone exhausted into the passenger compartment at an acceptable level, the subject-matter of claim 1 is not novel (Art.33(2) PCT).

- 2.2 EP 1 249 265 A (D2) refers to a replaceable air purifying filter cartridge (1) comprising a high voltage coronal plasma generator and electrostatic filter, which indeed also generates ozone (paragraph 36). However, since the device of D2 also includes an ozone decomposition catalyst (3), the subject-matter of claim 1 is not prejudiced by D2.
- 2.3 WO 03/028880 A (D3) discloses an air purification module comprising electric discharge coronal plasma generator followed by HEPA filter. The device is suitable for keeping the exhausted ozone concentration at an acceptable level. Since D3 explicitly indicates that the plasma generator produces ozone (paragraph 51) and that the concentration of such reactive oxidative species effect sterilisation more rapidly (paragraph 53), it is not understood how the plasma generator cannot be considered an ozone generator. The optional scrubber (38) is only necessary if the ozone level exhausted becomes unacceptable.

Consequently, since the device of D3 discloses the features of claim 1, the latter also lacks novelty over this document (Art.33(2) PCT).

- 2.4 US 5 087 428 A (D4), US 2003/131439 A1 (D5) and EP 0 824 041 A(D6) refer to more remote embodiments of air purification devices comprising a coronal discharge ozone generator and a high airflow electrostatic filter.

Neither one of these devices, however, challenge the novelty of claim 1.

3. In the light of the prior art as cited above, dependent claims 2-18 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

Ad Section VII:

1. The features of the claim/s are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

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Claims

1. An air filtration cartridge suitable for use in the treatment of air in a forced airflow air supply system having an air supply conduit provided with an in-line filtration cartridge mounting formed and arranged for releasably mounting a replaceable air filtration cartridge so that the air supply is passed through said cartridge, said cartridge comprising a casing having: an upstream stage defining a chamber having an inlet for receiving a said forced airflow, in use of the cartridge, and an outlet, and mounting, inside said chamber, at least one low power coronal discharge ozone generator, said at least one ozone generator being formed and arranged for generating a restricted concentration of ozone and any other reactive species formed together therewith, within an inactivating zone contained within said cartridge, through which said air flow is passed in use of said cartridge, which restricted concentration is sufficient effectively to inactivate airborne pollutant material entrained in said air flow, yet which restricted concentration decays sufficiently outside said inactivating zone so that the concentration of ozone in the cleaned air expelled from said cartridge, preferably from said upstream stage thereof, is at a physiologically acceptable level without the use of an ozone decomposition catalyzer; and a downstream stage coupled to said upstream stage outlet and formed and arranged for mounting, in use of the cartridge, a high airflow electrostatic filter.
2. The cartridge of Claim 1 wherein said low power corona discharge ozone generator comprises a low power corona discharge device provided with a low power high voltage output transformer.

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3. The cartridge of Claim 2 wherein the low power corona discharge device comprises concentric tubular metal gauze electrodes separated by a tubular strengthened glass dielectric.

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4. The cartridge of Claim 3 wherein the glass dielectric is of titanium dioxide strengthened borosilicate glass.

5. A cartridge according to any one of claims 1 to 4 wherein the low power corona discharge ozone generator has a power rating of from 4 to 50 watts.

6. A cartridge according to any one of claims 1 to 5 wherein is used for said alternating current corona discharge ozone generator, an AC supply with a frequency in the range from 50 to 1000 Hz.

7. A cartridge according to any one of claims 1 to 6 wherein is used an AC supply with an operating voltage in the range from 1 to 6 kV.

8. A cartridge according to any one of claims 1 to 7 wherein is used an AC supply providing a (starting) current in the range from 1 to 10 mA.

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9. A cartridge according to any one of claims 1 to 8 wherein is used a low power corona discharge device with a solid dielectric.

10. A cartridge according to any one of claims 1 to 9 wherein is provided an array of ozone generators distributed across the airflow path through said upstream stage.

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11. A cartridge according to any one of claims 1 to 10 wherein said downstream stage filter mounting has a depth of from 5 to 50 cms.
- 5 12. A cartridge according to any one of claims 1 to 11 wherein said at least one inlet is fitted with at least one filter.
- 10 13. A cartridge according to claim 12 wherein is provided at least one inlet filter for removing smoke.
- 15 14. A cartridge according to any one of claims 1 to 13 wherein said downstream stage includes an annular air reservoir extending around a filter housing for said high airflow electrostatic filter, downstream of said filter, for the purpose of ensuring that the flow of air back into the aircraft air recirculation system is substantially unrestricted.
- 20 15. A cartridge according to any one of claims 1 to 14 wherein are provided seals formed and arranged for ensuring the forced airflow is directed through said upstream and downstream stages of the cartridge.
- 25 16. A cartridge according to any one of claims 1 to 15 wherein said filter mounting has a said high airflow electrostatic filter mounted therein.
- 30 17. A cartridge according to claim 16 wherein said filter is in the form of a stack of filter elements.
18. A method of cleaning air without the use of an ozone decomposition catalyzer, comprising the steps of:

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providing a cartridge according to claim 1 with a said high airflow electrostatic filter mounted in the filter mounting thereof;

powering the ozone generator of said cartridge so as to

- 5 generate ozone in the inactivation zone of said cartridge;
and passing a flow of said air through said inactivation zone
and then through said filter.